
An All-Recombinant Protein-Based Culture System Specifically Identifies Hematopoietic Stem Cell Maintenance Factors.

Journal: Stem Cell Reports

Publication Year: 2017

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PubMed link: 28238792

Funding Grants: Generation of functional cells and organs from iPSCs

Public Summary:

Hematopoietic stem cells (HSCs) are blood-forming stem cells important for life long supply of all blood cells. If we can expand HSCs in a test tube, we can use them to treat patients with anemia, leukemia or other blood related disorders. However, expansion of HSCs has been difficult despite numerous studies. In an attempt to improve culture conditions, we succeeded in establishing a culture system composed of recombinant, therefore clean culture medium. We also succeeded in identifying two proteins that help maintenance and expansion of HSCs in culture.

Scientific Abstract:

Hematopoietic stem cells (HSCs) are considered one of the most promising therapeutic targets for the treatment of various blood disorders. However, due to difficulties in establishing stable maintenance and expansion of HSCs in vitro, their insufficient supply is a major constraint to transplantation studies. To solve these problems we have developed a fully defined, all-recombinant protein-based culture system. Through this system, we have identified hemopexin (HPX) and interleukin-1alpha as responsible for HSC maintenance in vitro. Subsequent molecular analysis revealed that HPX reduces intracellular reactive oxygen species levels within cultured HSCs. Furthermore, bone marrow immunostaining and 3D immunohistochemistry revealed that HPX is expressed in non-myelinating Schwann cells, known HSC niche constituents. These results highlight the utility of this fully defined all-recombinant protein-based culture system for reproducible in vitro HSC culture and its potential to contribute to the identification of factors responsible for in vitro maintenance, expansion, and differentiation of stem cell populations.

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